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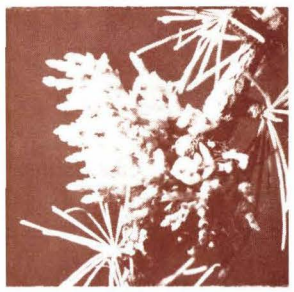

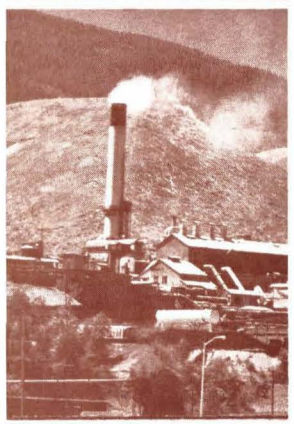

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STATUS OF MOUNTAIN PINE BEETLE INFESTATIONS, YELLOWSTONE NATIONAL PARK, WYOMING, 1974

by

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ABSTRACT

The mountain pine beetle, *Dendroctonus ponderosae* Hopk., infestation in Yellowstone National Park advanced north and eastward in 1974. New infestation centers were located along the east shore of Yellowstone Lake and south of the Promontory to the Park's southern boundary. Ground surveys indicated an average of 2.9 infested trees per acre. Average diameter of attacked trees was 11.0 inches. A decrease in number of infested trees continues to occur in older portions of the infestation in the southwestern corner of the Park. The outbreak has been declining since 1971 and the 1974 survey indicates a continued decline.

INTRODUCTION

Yellowstone National Park has suffered periodic infestations of mountain pine beetle, *Dendroctonus ponderosae* Hopk., since the late 1920's. The last reported outbreak began in 1931 and subsided in 1947 (Gibson 1947).

In 1966, a new infestation developed in the Park adjacent to infested National Forest lands in Idaho (Parker 1972). During the first year of the epidemic, lodgepole pine stands in the Cave Falls-Bechler River area suffered extensive tree mortality. During the succeeding 8-year period the infestation expanded north and eastward.

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By 1974 the infestations encompassed nearly one-half the Park area (Figure 1). New infestation centers in 1974 were detected along the east shore of Yellowstone Lake from Brimstone Basin to the Pelican Creek Campground and directly south of the Promontory to the Park's southern boundary.

METHODS

Ground surveys during 1974 were conducted on eight square-mile blocks to measure volume loss and number of trees killed per acre. Within each 640-acre block, variable plots were located at 5-chain intervals. Three lines forming an equilateral triangle with sides 1 mile long were run in each section. Wedge prisms (BAF-10) were used to estimate trees per plot. Trees within plot boundaries were recorded by species, diameter at breast height (d.b.h.), and total height. Attacked and beetle-free trees were recorded using the following categories:

0 - green, uninfested.
1 - 1974 attack; green foliage, brood present.
2 - 1973 attack; red foliage, brood emerged.

Data were analyzed using a modified Region 1 ADP sale cruise program. Number of infested trees, trees per acre, volume losses per year, and residual green stand were summarized.

RESULTS

In areas surveyed, the coniferous stand is approximately 85 percent lodgepole pine, *Pinus contorta* Douglas; 6 percent alpine fir, *Abies lasiocarpa* Hopk.; 4 percent Engelmann spruce, *Picea engelmanni* Parry; and 3 percent whitebark pine, *Pinus albicaulis* Engelmann. Douglas-fir, *Pseudotsuga menziesii* var *glauca* Beissen; and aspen, *Populus tremuloides* Michx., occur infrequently throughout the stands. Ecological habitat types vary from *Pseudotsuga menziesii/Calamagrostis pubescens* at the lower elevations (ca 6,100 feet) to *Abies lasiocarpa/Vaccinium* spp. at higher elevations (ca 8,900 feet).

A total of eight areas including 5,120 acres were surveyed in 1974. Seven of these areas were also surveyed in 1973 and these data are included for comparison. Estimated tree mortality and volume loss data for the 2-year period are shown in Tables 1 and 2. The highest level of infestation occurred at Buffalo Cabin where 10.7 lodgepole pine were infested per acre. This represented an increase of 1.2 infested trees per acre over 1973. In general, however, there was a decline in number of trees infested from 4.6 per acre in 1973 to 2.9 per acre in 1974.

Mountain Pine Beetle Infestation Area 1974

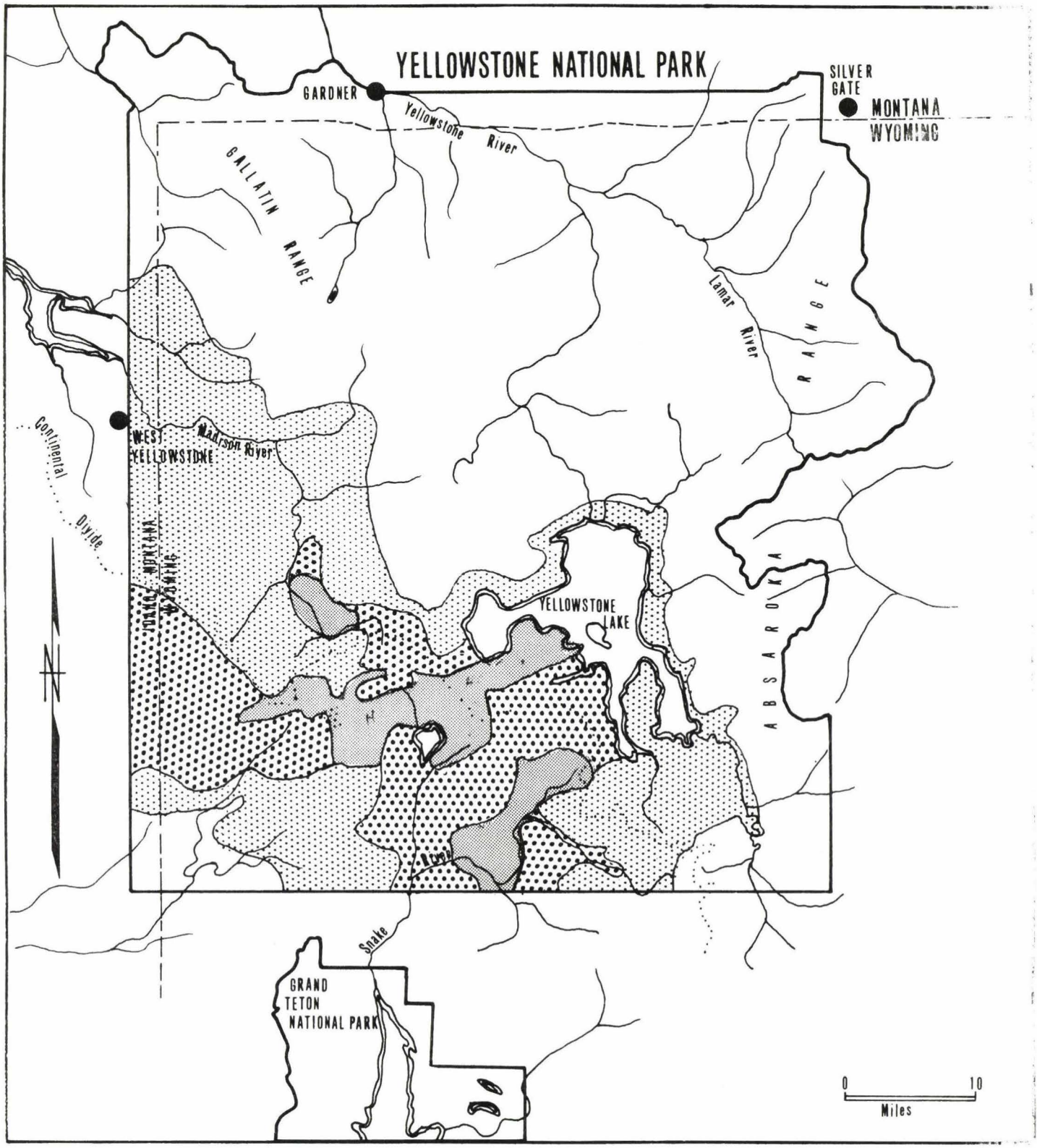

Table 1.--Estimated lodgepole pine mortality in survey areas due to mountain pine beetle, Yellowstone National Park, 1973-74.

Area surveyed	Acres surveyed		Infested trees/acre		Total trees killed	
	1973	1974	1973	1974	1973	1974
Duck Creek (7306)	640	640	1.1	2.4	674	1,556
Summit Lake (4304)	640	640	9.1	5.2	5,812	3,299
NezPerce (5311)	640	640	.5	.4	296	269
Lone Star (3301)	640	640	2.9	.6	1,828	396
Arnica Creek (4303)	640	640	3.1	1.3	1,959	835
Buffalo Cabin (2201)	640	640	9.5	10.7	6,060	6,833
Phantom Trail (1204)	640	640	6.0	2.9	3,869	1,846
Cabin Creek (2401)	--	640	--	.4	--	240
Average or Total	4,480	5,120	4.6	2.9	20,498	15,274
Grand Total					35,772	

Table 2.--Estimated lodgepole pine volume loss in survey areas caused by mountain pine beetle, Yellowstone National Park, 1973-1974.

Area surveyed	Infested vol./acre (bd.ft.)		Total vol. loss (bd.ft.)	
	1973	1974	1973	1974
Duck Creek (7306)	86	94	55,135	60,162
Summit Lake (4304)	364	483	233,132	309,019
NezPerce (5311)	63	46	40,464	29,275
Lone Star (3301)	106	105	67,970	67,107
Arnica Creek (4303)	155	52	99,248	33,198
Buffalo Cabin (2201)	547	665	349,976	425,403
Phantom Trail (1204)	569	371	363,854	237,296
Cabin Creek (2401)	--	43	--	27,610
Total			1,209,779	1,189,070
Grand Total			2,398,849	

An estimated 35,772 lodgepole pine with a merchantable volume of 2,398,849 board feet were killed in survey areas. An additional 644 whitebark pine were killed in 1974 with a volume loss of 15,932 board feet.

Average diameter (d.b.h.) of lodgepole pine attacked in 1973 and 1974 was 10.0 and 11.0 inches respectively.

Percent tree mortality by diameter class is shown in Table 3. Approximately 86 percent of the trees infested were 10 inches d.b.h. and larger in 1973 and 1974. Of the remaining green stand only 55 percent is 10 inches d.b.h. and larger.

Table 3.--Percent lodgepole pine killed by diameter class, Yellowstone National Park survey areas, 1973-74.

Item	D.b.h. in inches											
	< 6	6	8	10	12	14	16	18	20	22	24	> 24
Remaining green trees	5.79	17.69	21.46	19.41	14.11	9.18	5.00	2.31	2.54	0.93	0.97	0.60
1974	--	5.95	8.33	22.62	22.62	13.10	8.33	5.95	5.95	2.38	1.19	3.57
1973	.39	3.13	9.77	10.55	13.67	15.23	8.98	7.81	17.97	5.47	3.13	3.91

DISCUSSION

The current mountain pine beetle infestation has caused considerable loss of lodgepole pine in Yellowstone National Park. Trend of the outbreak inclined steadily from 1966 to 1970. A decline in infestation levels occurred from 1971 through 1974 (Berg and McGregor 1972, McGregor and Berg 1973, Hamel, et al. 1975). At the peak of the outbreak there were approximately 19 infested trees per acre. Currently there are 2.9 infested trees per acre.

Available food is probably the most significant limiting regulatory factor for survival of mountain pine beetle broods (Amman 1969). Although phloem-tree diameter relationships are variable, larger diameter trees generally contain the thickest phloem (most food), and small diameter trees the thinnest phloem. During the course of a mountain pine beetle outbreak, the larger diameter trees are infested and killed first, as well as over the life of the outbreak. Only large trees (12 inches d.b.h. and greater) can produce more beetles than they absorb (Cole and Amman 1969).

In the areas surveyed in Yellowstone National Park in 1973 and 1974, 86 percent of the infested trees were 10 inches d.b.h. and greater indicating that the larger diameter trees are being attacked first. Since only 55 percent of the remaining green stand is 10 inches d.b.h. and greater and only 35 percent is 12 inches d.b.h. and greater, it can be expected that with the decrease in available food there will be a decline in infestation intensity.

Although the decline in mountain pine beetle populations is expected to continue in old infestation centers, new outbreak conditions are expected to develop in areas north and east of the present infestation boundaries.

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